Name _____ Date _____

Ecosystem Analysis

Choose any country/region with a distinct biome that you can research information about.

Use the website to estimate the information in step 1 below and follow subsequent steps to construct a data table as per my example.

Look for the **Global Horizontal Irradiation Map** on the site:

http://solargis.com/products/maps-and-gis-data/download/world

Step 1 – Use map to determine **DAILY KWh/m^2** energy for an area of your choice.

5.2KWh/m^2 (I chose Central India)

Step 2 – Convert into Kcal/km^2 (this will be the standard area for everyone)

4.5 x 10^9kcal/km^2 *look up conversion tool online (KWhr → kcal) & (m^2 → km^2)*

Step 3 – Multiply by 1.3% (.013) to estimate energy stored by producers & available in producer trophic level in a square kilometer.

(1.3% x 4.5 x 10^9kcal) = 5.8 x 10^7 kcal/km^2

Input only the kcal unit since the standard is understood to be over an area of 1km^2 (about 247 acres)

Step 4 – Fill in the energy available in each level by using the 10% energy transfer rule.

Step 5 – Choose plants & animals appropriate for your chosen region. Each energy analysis table should have at least 3 trophic levels (Prod, primary cons. & sec. cons) but can have more levels. Only choose 1 organism type for each level, essentially 1 food chain is being analyzed.

Step 6 – Find the average mass of each chosen animal.

Step 7 - Calculate the energy required per individual by using the following guide:

Organism type	**Multiply mass in kg by number below**
Endotherm	kg x **24.7** to give required kcal
Ectotherm	kg x **10** to give required kcal

Step 8 – Calculate the maximum number of individuals by dividing the energy available in level by the energy required per individual.

Name _____ Date _____

Teacher Example

Organism Level	Total energy available in Level (in **kcal**)	Average Mass of an Individual (in **kg**)	Required energy per individual (in kcal)	Max. # of individuals
Grass	5.8×10^7 kcal	N/A	N/A	N/A
Grasshopper	5.8×10^6 kcal	0.017 kg	.17 kcal	3.4×10^7
Mouse	5.8×10^5 kcal	0.030 kg	.74 kcal	7.8×10^5
Cobra	5.8×10^4 kcal	6 kg	33.6 kcal	1726

Generate your own table on separate paper using the model above. MAKE NEATLY!

Analysis Questions to answer in paragraph format on separate paper:

1. Explain the "loss" of energy from the producer level to the primary consumer level. Why doesn't all the energy transfer to the primary consumers and where does all the "lost" energy go?

2. Explain the "loss" of energy from the primary consumer level to the secondary consumer level. Why doesn't all the energy transfer to the secondary consumers and where does all the "lost" energy go?

3. The concept of biological magnification refers to how toxic substances, like mercury found in fish, accumulate more so up each trophic level. These toxins generally accumulate & remain in the fat of animals instead of being excreted. Explain why biological magnification occurs even though the number of organisms in each higher trophic level generally decreases.

4. Identify 1 keystone species that is not included in this energy analysis and predict how the inclusion of this species would impact the flow of energy & organic matter.

5. Explain 3 other factors (besides exclusion of keystone species) that are not included in this model that would impact the data in the table. Be sure to describe how the table values would change.

6. Describe a scenario which could cause the ecosystem to undergo primary succession. Predict the series of events that would occur to re-establish the community.

7. Describe a scenario which could cause the ecosystem to undergo secondary succession. Predict the series of events that would occur to re-establish the community.